

REMARKS

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The present invention as set forth in **amended Claim 1** relates to a photoreceptor, comprising:

an electroconductive substrate;

a charge generation layer located overlying the electroconductive substrate optionally with an intermediate layer therebetween; and

a charge transport layer formed overlying the charge generation layer using a non-halogenated solvent and comprising a charge transport material and a resin;

wherein the charge generation layer comprises

a polyvinyl acetal resin, and

a charge generation material having an average particle diameter less than a roughness of a surface of either the electroconductive substrate or the intermediate layer, on which the charge generation layer is located;

wherein the average particle diameter of the charge generation material is not greater than 0.3 μm and not greater than 2/3 of the roughness of the surface of either the electroconductive substrate or the intermediate layer;

wherein the charge generation material is a titanyl phthalocyanine;

wherein the titanyl phthalocyanine has an X-ray diffraction spectrum in which a maximum peak is observed at a Bragg (2 θ) angle of $27.2^\circ \pm 0.2^\circ$ when a Cu-K α X-ray having a wavelength of 1.542 Å is used;

wherein the titanyl phthalocyanine further has a lowest angle peak at an angle of $7.3^\circ \pm 0.2^\circ$, and wherein an interval between the lowest angle peak to a next peak at a high angle side is not less than 2.0° ;

wherein the titanyl phthalocyanine has no peak at an angle of 26.3° ; and

wherein said titanyl phthalocyanine has a peak in the X-ray diffraction spectrum at an angle of $23.5^\circ \pm 0.2^\circ$.

Claim 28 relates to a photoreceptor, comprising:

an electroconductive substrate;

a charge generation layer located overlying the electroconductive substrate optionally with an intermediate layer therebetween; and

a charge transport layer formed overlying the charge generation layer using a non-halogenated solvent and comprising a charge transport material and a resin;

wherein the charge generation layer comprises

a polyvinyl acetal resin, and

a titanyl phthalocyanine having an average particle diameter less than a roughness of a surface of either the electroconductive substrate or the intermediate layer, on which the charge generation layer is located,

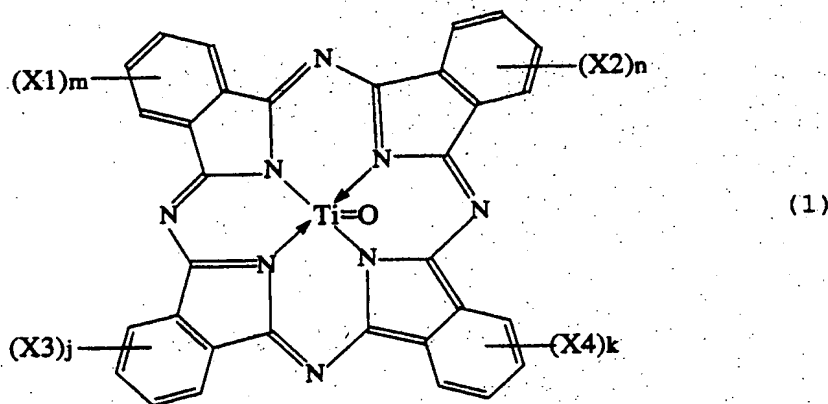
wherein the titanyl phthalocyanine has an X-ray diffraction spectrum in which a maximum peak is observed at a Bragg (2θ) angle of $27.2^\circ \pm 0.2^\circ$ when a Cu-K α X-ray having a wavelength of 1.542 Å is used,

wherein the titanyl phthalocyanine further has a lowest angle peak at an angle of $7.3^\circ \pm 0.2^\circ$, and wherein an interval between the lowest angle peak to a next peak at a high angle side is not less than 2.0° ;

wherein the titanyl phthalocyanine has no peak at an angle of 26.3° ;

wherein the average particle diameter of the charge generation material is not greater than $0.3\ \mu\text{m}$ and not greater than $2/3$ of the roughness of the surface of either the electroconductive substrate or the intermediate layer; and

wherein said titanyl phthalocyanine is represented by formula (1)



wherein X1, X2, X3 and X4 independently represent a halogen atom, and m, n, j and k are independently 0 or an integer of from 1 to 4.

Niimi ('633), Nukada, Takaya, ACS File Registry, Niimi ('654), Oshiba, and Tamura fail to disclose or suggest the photoreceptors claimed in Claims 1, 28 and 29. Niimi ('633), Nukada, Takaya, ACS File Registry, Niimi ('654), Oshiba, and Tamura also fail to disclose or suggest the superior properties of the claimed photoreceptors as set forth in the specification.

In order to protect environment, it is desired not to use a halogenated solvent when a photoreceptor is produced, particularly when a charge transport layer is prepared (because a large amount of solvent is used for preparing a charge transport layer). The object of the present invention is to prepare a charge transport layer without using a halogenated solvent. If a halogenated solvent is merely replaced with a non-halogenated solvent, the resultant photoreceptor is inferior in characteristics (such as photosensitivity). The reason therefore is as follows.

When a charge transport layer coating liquid including a non-halogenated solvent is coated on a charge generation layer, the charge generation material therein aggregates due to the solvent and thereby the specific surface area of the charge generation material decreases. Therefore, the probability that the charge generation material contacts with the charge transport material decreases, resulting in deterioration of photo-carrier generation efficiency,

i.e., deterioration of photosensitivity. Therefore, it is necessary to prevent occurrence of aggregation of the charge generation material to avoid the photosensitivity deterioration problem. This can be achieved by controlling the surface roughness of the intermediate layer and the particle size of the charge generation material, the charge generation material aggregation problem can be avoided.

In other words, only after the following four points are understood, the present invention can be made:

- 1) to use a non-halogenated solvent;
- 2) when a non-halogenated solvent is used for preparing a charge transport layer on a charge generation layer, the charge generation material aggregates;
- 3) when the charge generation material aggregates, the photosensitivity of the resultant photoreceptor deteriorates; and
- 4) by controlling the surface roughness and the particle size of charge generation material, the charge generation material aggregation problem can be avoided.

Since these points are not disclosed and suggested in Niimi ('633), Nukada, Takaya, ACS File Registry, Niimi ('654), Oshiba, and Tamura, the present invention is not obvious.

Specifically, there is no disclosure in these references that agglomeration of the charge generation layer can be avoided as disclosed at pages 17 and 18 of the specification.

There is also no disclosure of the superior results obtained in the Examples of the present invention. See pages 82-84 of the specification.

Table 2

| | Solvent of CTL liquid | Ave. particle diameter (μm) | Surface roughness (μm) | Image qualities | | VL (-V) | |
|-------|-----------------------|-----------------------------|------------------------|---------------------|---------------|----------------------|--------------------|
| | | | | Back-ground fouling | Image density | At the start of test | At the end of test |
| Ex. 1 | THF | 0.2 | 1.0 | ○ | ○ | 90 | 95 |
| Ex. 2 | THF | 0.2 | 0.6 | ○ | ○ | 85 | 95 |
| Ex. 3 | THF | 0.2 | 0.3 | Δ | ○ | 85 | 90 |
| Ex. 4 | THF | 0.2 | 0.4 | ○ | ○ | 95 | 105 |

| | | | | | | | |
|-------------|----------------------|-----|-----|----------|----------|-----|-----|
| Ex. 5 | THF | 0.6 | 1.0 | Δ | \circ | 100 | 125 |
| Ex. 6 | Dioxolan | 0.2 | 1.0 | \circ | \circ | 100 | 110 |
| Ex. 7 | THF/toluene | 0.2 | 1.0 | \circ | \circ | 80 | 85 |
| Comp. Ex. 1 | THF | 0.2 | - | X | X | 100 | 160 |
| Comp. Ex. 2 | THF | 0.6 | 0.6 | X | Δ | 110 | 150 |
| Comp. Ex. 3 | THF | 0.6 | 0.3 | X | X | 100 | 170 |
| Comp. Ex. 4 | THF | 0.6 | 0.4 | X | X | 115 | 165 |
| Comp. Ex. 5 | THF | 0.6 | - | X | X | 120 | 180 |
| Comp. Ex. 6 | Dioxolan | 0.2 | - | X | X | 130 | 200 |
| Comp. Ex. 7 | THF/Toulene | 0.2 | - | X | X | 100 | 160 |
| Ref. Ex. 1 | Dichloro- methane | 0.2 | 1.0 | Δ | \circ | 85 | 90 |
| Ref. Ex. 2 | Chloroform | 0.2 | 1.0 | Δ | \circ | 95 | 100 |
| Ex. 8 | THF | 0.2 | 0.6 | Δ | Δ | 115 | 145 |
| Ex. 9 | THF | 0.2 | 0.6 | Δ | Δ | 105 | 135 |
| Ex. 10 | THF | 0.2 | 0.6 | Δ | Δ | 110 | 140 |
| Ex. 11 | THF | 0.2 | 0.6 | Δ | Δ | 105 | 140 |
| Ex. 12 | THF | 0.2 | 0.6 | Δ | Δ | 110 | 145 |
| Ex. 13 | THF | 0.2 | 0.6 | Δ | Δ | 105 | 135 |
| Ex. 14 | THF | 0.2 | 0.6 | \odot | \odot | 85 | 95 |
| Ex. 15 | THF | 0.2 | 0.6 | \odot | \circ | 80 | 90 |
| Ex. 16 | THF | 0.2 | 1.0 | Δ | \circ | 100 | 120 |
| Comp. Ex. 8 | THF | 0.2 | 1.0 | X | Δ | 100 | 145 |

As can be understood from Table 2, the photoreceptors of Examples 1 to 16, whose CGL is formed without using halogen-containing solvents, can maintain good photosensitivity even when used for a long period of time. Therefore, the photoreceptors can stably produce good images.

In addition, as can be understood from comparison of the photoreceptor of Example 2 with the photoreceptors of Examples 8 to 13, a TiOPc having a maximum peak at a Bragg (2 θ) angle of $27.2^\circ \pm 0.2^\circ$ and a lowest angle peak at $7.30^\circ \pm 0.2^\circ$ without having a peak in an angle range of from 7.4° to 9.4° and at an angle of 26.3° is used, the resultant photoreceptor has relatively good properties compared to the photoreceptors using other TiOPc. In addition, when the CGL coating liquid is filtered with a filter having an effective pore diameter of 3 μm to remove large particles therein (Example 15) or a TiOPc synthesized so as to have a relatively small particle diameter is used (Example 14), the resultant photoreceptors have better properties than the photoreceptor of Example 2.

These superior results are not disclosed or suggested by Niimi ('633), Nukada, Takaya, ACS File Registry, Niimi ('654), Oshiba, and Tamura.

Regarding Nukada's X-ray diffraction spectrum, Applicants wish to note the following.

Enlarged FIGS. 1-9 of Nukada are attached herewith. In addition, the angles of the peaks in the range of from 19° to 26° are described therein. **The spectra of FIGS. 1-3 and 5-9 do not have a peak near 23.5°.** In addition, **the spectrum of FIG. 4 has no 23.5° peak** and several peaks on the lower angle side from the angle of 23.5°. Namely, a projection observed at an angle slightly lower than 23.5° is **not** a peak.

The X-ray spectrum of Nukada is also different from that of the present invention in the peaks in the angle range of from 9° to 10°. Specifically, the X-ray diffraction spectrum of FIG. 13 in the present application has two clear peaks (9.5° and 9.7°) in the angle range whereas the X-ray diffraction spectra illustrated in Nukada's FIGS. 1-9 has no clear peak in the range. Therefore, the TiOPc crystal of the present invention is different from the Nukada's TiOPc crystal.

Niimi ('633), Nukada, Takaya, ACS File Registry, Niimi ('654), Oshiba, and Tamura, alone or in combination, fail to disclose or suggest **the combination** of the titanyl phthalocyanine having the specified structure and/or peak at $23.5^\circ \pm 0.2^\circ$ and having an average particle diameter less than a roughness of a surface of either the electroconductive substrate or the intermediate layer and a charge transport layer formed using a non-halogenated solvent.

Therefore, the rejections of the Claims over Niimi ('633), Nukada, Takaya, ACS File Registry, Niimi ('654), Oshiba, and Tamura are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

Application No.: 10/606,750
Reply to the Office Action dated: May 26, 2006

The double patenting rejection over Serial No. 10/665,155, now Patent Number 7,029,810, is obviated by the corrected Terminal Disclaimer filed herewith.

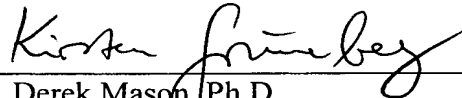
The Examiner is requested to withdraw the **provisional** double patenting rejections over Serial Nos. 10/804,067, and 10/655,280 if they are the only remaining rejections in the case. See MPEP 822.01.

The objection to Claims 1 and 29 are obviated by the amendment of these claims.

This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



J. Derek Mason, Ph.D.
Registration No. 35,270

Customer Number
22850

Kirsten A. Grueneberg, Ph.D.
Registration No.: 47,297

Tel: (703) 413-3000
Fax: (703) 413 -2220
NFO:KAG: